ROCHESTER
UNIVERSITY of

Math 164: Multidimensional Calculus

Midterm Exam 2
April 3, 2008

Name (please print legibly): _____

University ID Number: _____

Please check the box of your instructor:

	Thomas Tucker	MWF	1000-1050
	Andrew Ledoan	MWF	0900-0950

- Calculators, cell phones, iPods, and other electronics are not allowed on this exam.

- Please show all your work. You may use the backs of pages if necessary. A correct answer with no work shown will not receive full credit. Please label and circle your final answers.

- You are responsible for checking that this exam has all 8 pages. Please tell us immediately if your exam is missing a page. Missing pages will not contribute to your total score.

Question	Points	Score
1	15	
2	15	
3	12	
4	12	
5	15	
6	16	
7	15	
Total:	100	

1. (15 points) Find the maximum and minimum values of the function $f(x, y) = 3x + 3y + 5$ on the ellipsoid $x^2 + 2y^2 = 24$.

2. (15 points) Find the point on the sphere $x^2 + y^2 + z^2 = 9$ on which the tangent plane is parallel to the plane $x + 2y + 2z = 11$.

3. (12 points) Evaluate $\iint_D xe^{x^3}\,dA$, where $D = \{(x, y) \mid 0 \le y \le 1, y \le x \le 1\}$.

4. (12 points) Evaluate $\iint_R x \cos(xy)\, dA$, where $R = \{(x, y) \mid 0 \le x \le \pi, 1 \le y \le 2\}$.

5. (15 points) Find the maximum rate of change of the function $f(x, y) = x^2 e^{-y}$ at the point $(2, 0)$ and the direction in which it occurs.

6. (16 points) Find and classify, as local maximum, local minimum, or saddle point, the critical points of the function $f(x, y) = x^3 - 3x + 2y^3 - 24y^2$.

7. (15 points)

(a) **(7 points)** Let $w = e^{x+y}$ where $x = \sin t$, $y = tu^2$. Find the numerical values of $\partial w/\partial t$ and $\partial w/\partial u$ when $(t, u) = (\pi, 2)$.

(b) **(8 points)** The width of a rectangle is increasing at a rate of 2 in/s., while its length is decreasing at a rate of 1 in/s. At what rate is the area of the rectangle changing when the length is 5 in and and width is 3 in.